Are there Enough Doctors in My Community?
People's Perception of Local Physician Supply.

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ABSTRACT

Purpose. To assess how closely people's perception of local physician supply relates to physician-to-population ratio, and identify what other factors are associated with this perception.

Method. Adults (n=4,879) from 150 Southern rural counties completed telephone surveys November 2002-July 2003. Response to a question about perception of adequacy of local physician supply was analyzed with bivariate and multivariate methods assessing strength of association between this perception and actual physician-to-population ratio, individual characteristics, county characteristics, and perceptions about and experience with health care.

Results. Respondents more likely to feel there were enough physicians in their area include those who were less likely to state: doctors should be used as a last resort (OR 2.0, $p < .001$), their travel time to care was less than 30 minutes (OR 1.52, $p < .001$), cost of care was not a problem for them (OR 1.45, $p < .001$), they were satisfied with the care they had received (OR 1.67, $p = .023$) and confident in the skills of their physician (OR 1.39, $p = .006$). Respondents in areas with higher physician-to-population ratios, who were over 65, White, male, and in good health were also more likely agree there were enough local doctors. In our model most variance in opinion about physician supply was explained by perceptions and experience variables, followed by individual characteristic variables, physician-to-population ratio, and county-level variables.

Conclusions. People with positive perceptions about and experiences with health care are more likely to perceive that there are not enough physicians in their community. This perception was more strongly associated with perception of adequacy of physician supply than other variables, including physician-to-population ratio.

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INTRODUCTION

Rural residents, especially those in the rural south, suffer from poorer baseline health status, less access to health care, and specifically less access to physicians than urban residents.[2, 3 4, 5] Over the past 30 years, although the number of physicians has increased in all areas, the disparity between physician-to-population ratios in rural areas relative to urban areas has continually worsened.[2, 5-8] Federal and state governments have attempted to address this problem with programs that place physicians in areas with low physician-to-population ratios, presuming that additional physicians would translate into greater access to physician care in these areas.[6, 7] However it is not clear if increasing the number of physicians alone improves local residents' access to care.[7, 9, 10]

Access to Care

It is necessary to step back briefly to discuss the definition of "access to care" before moving further forward with the more specific discussion of access to physician care. Defining access to care has been a career-long effort for many in health services research and medical sociology. Most agree broadly that "access to care" refers to whether an individual or group is able to get medical care, and most measures of access to care in use today are based on a theoretical

model developed by Ronald Andersen, Lu Ann Aday, and colleagues.[11] This model (which has been revised and updated a number of times) proposes that characteristics of the health care system, the individual and the environment interact with the individual's resources and need for health care to influence their personal health practices and use of health services.[1, 12] One of the more recent iterations of Andersen's model theorizes that a person's perceived health status, evaluated health status, and satisfaction with health services depend on all of the aforementioned variables and then become part of the individual's "enabling resources and predisposing characteristics" feeding back in to their perceived need for health care. (Figure 1).[1] This idea that an individual's perceptions of oneself, one's health, and perceptions about medical care could affect one's perception of need for medical care affects how we think about, discuss, and measure access to care.

How to measure access to care has been debated for over 60 years.[13] Many organizations (Institute of Medicine, Robert Wood Johnson Foundation, Rand Corporation, World Health Organization) appear to have settled upon measuring access by asking people whether have had unmet medical needs, postponed care they thought they needed, whether they have a usual source of care, whether they have health insurance, whether they are satisfied with their care, whether they have seen a doctor in the past year and similar questions.[13-20] There is usually some variation or addition to these questions depending upon what the researcher is studying (e.g. whether a child with special needs was able to get referred to appropriate specialists, whether language was a barrier for

immigrants, etc.[14, 15, 21]) but a person's perception of need for medical care is almost always assessed as a, or the, main outcome in studies of access to care.

Using perceived need for care as the main outcome or measurement of access to care makes some important assumptions. For instance, asking someone whether there was a time in the past year when they "did not get needed medical care" assumes that he or she could accurately perceive need for medical care (not always true with many common diseases such as hypertension, diabetes, depression, and hyperlipidemia). Another assumption inherent in the questions about unmet or postponed care is that the subject believes that allopathic medicine is efficacious. If a person does not have a positive view of allopathic medicine or physicians due to social, cultural, historical, or personal experience then he or she may report a "satisfactory" level of access when there is no access to care.

This concept of perceptions being due to one's experiences, individual and environmental characteristics as well as affecting one's future actions and future perceptions is illustrated in a modified model of access in Figure 2. This model represents the complexity of the dynamic interaction between mutable perceptions, immutable characteristics, and available resources all of which likely affect perception of local physician supply.

Rural Physician Workforce Planning

The goal of rural physician workforce planners is to improve access to physician care in rural areas.[6, 9, 22] Physician workforce researchers do

not approach access to physician care in the same way that access to care researchers approach their subject. Generally physician workforce researchers do not directly ask people whether they have adequate access to a physician or feel they need more physicians in their area. Models and decisions about the number of doctors necessary to meet the health care needs of a community are generally based on externally measured characteristics of communities and populations. Models and formulas developed by experts to determine the optimal physician-to-population ratio and specialty mix generally include county level data such as distribution of age, gender, poverty level, as well as health indicator such as infant mortality rate and prevalence of chronic illness in their calculations.[7, 9, 22-26] In the recent past, task forces and policymaking bodies have produced recommendations on the reform and redistribution of the physician workforce based mainly on these factors. [22]

Up until now, even those researchers who attempt a "patient-oriented" approach to estimate physician supply needs have used the tautology of previous utilization patterns as a proxy for patient demand or desire for care. [24] The supposition is that by examining objective measures such as demographic characteristics and past behavior we can determine how many physicians are "enough." However, policymakers' understanding of people's needs is not necessarily the same as people's understanding of their own needs. Perhaps physician workforce planners should turn towards some more difficult, but perhaps more relevant ways of assessing need for physicians—asking people what they think.

There has already been a trend in physician workforce planning to turn away from what some call the "needs based model." This model supports increasing physician supply in areas with fewer physicians based on a theoretically ideal amount and type of services needed to maintain and promote the health of a population.[25, 27] The dominant opposing model supports increasing physician supply based on increasing utilization of care patterns, the perceived desire for more specialty care, a trend towards more technological interventions, and our national trend of continually increasing our spending on health care.[28, 29] Again, neither side of the debate is considering people's perceived access to physician care.

Physician workforce planners on both sides of this debate have been criticized for not including actual "consumer viewpoints" in physician workforce needs assessments, as people's perceptions of both their access to medical care and the quality of care they receive have been shown to significantly affect their health care seeking behavior.[9, 30, 31] However, it has been seen that higher physician-to-population ratios do not necessarily imply greater access, and that access to physicians in rural areas may depend more on one's financial, sociodemographic, and cultural background than has been previously recognized.[30,10] In one multivariate analysis, an elderly population's perceptions about health care and socioeconomic factors were much more likely to be barriers to care than a low physician/population ratio or the inconvenience of getting to a physician's office. [32] If ability to pay for care and perceptions about medicine are playing more of a role in access to care than physician to population ratio, then

perhaps we need to pay more attention to these potential barriers. Actual need and perceived need cannot be effectively separated or easily defined – and both must improve before access is improved.

How people in medically underserved areas *perceive* availability of medical care affects how, where, whether, and from whom they will seek care. In the 1970s and 1980s studies suggested that an individual's characteristics and predisposing opinions or perceptions about medical care in general had more to do with perception of a need for more local physicians than the actual number of physicians nearby. [32, 33] Ronald Andersen posited that people's use of health services is a function of their original predisposition to use services (in part determined by how they feel about medical care), along with their ability to access care and their need for care.[1] A study of data from the Illinois Health Survey in 1980 found that people with "positive attitudes about the medical system" were more likely to visit a physician when they perceived their symptoms to be significant than those with negative attitudes towards the medical system.[34] In a study by the Rand Corporation, small differences in patient satisfaction scores of previous medical care had a significant associations with whether they would seek care in given hypothetical situations.[31] One study of physician utilization patterns in the elderly found that while a higher local physician-to-population ratio was associated with a higher likelihood of visiting a physician, a stronger predictor of physician contact was not having "doubts about some things doctors say they can do for you." In another study of consumer perceptions of local health care, rural residents perceived locally available medical services as

inferior to those available in nearby urban settings and in many cases preferred to travel to these larger urban health facilities.[35]

Despite multiple research groups finding indications that certain attitudinal and background characteristics have as much to do with access to physician care as physician-to-population ratio, there has been little recent research exploring this further. The models to date have studied one or two attitudinal characteristics and their association with a person's predisposition to seek care and opinion about access to care. A more comprehensive model (Figure 2) may more closely reflect the complexities of the connections between individual characteristics, environmental characteristics, access to care, perception of access to care, perception of number of physicians, and perceptions of and attitudes about health care attitudes.

Our aim is to further understand what factors are associated with the perception of physician supply adequacy. We do not suggest that perception of inadequate physician supply be considered a proxy for need for more physicians, nor that the perception of an adequate number of physicians be considered "enough." We seek to understand what factors affect perceptions of availability of physicians. The objectives of this study are to determine how closely people's perception about local physician supply is correlated with the actual physician-to-population ratio in their area, and to discover what other factors are associated with the perception of physician supply adequacy.

METHODS

Survey Instrument

Survey data were obtained by telephone interviews consisting of 89 questions about subjects' perceptions about health care and access-to-care fielded from November 2002 to July 2003 as part of the evaluation of the Robert Wood Johnson Foundation's Southern Rural Access Program (SRAP). The primary aim of the SRAP is to improve access to basic health care in targeted rural areas of 8 states (Alabama, Arkansas, Georgia, Louisiana, Mississippi, South Carolina, eastern Texas, and West Virginia—see Figure 3).[3] Project leaders in each state selected counties for participation in the SRAP based on perceived local health needs and program feasibility in that area.

The survey was administered by Professional Research Consultants, Inc. of Omaha, Nebraska (www.prconline.com). The survey sample was obtained using accepted random digit dialing techniques within telephone exchanges in SRAP's 150 non-metropolitan counties with over-sampling of residents in smaller counties. In each household reached, one English or Spanish-speaker over the age of 18 who had lived in the community for at least 12 months was randomly selected to participate. The overall response rate to the survey was 51.0%, with 4,682 refusals and 4,879 participants.[36] The University of North Carolina's Office of Human Research Ethics reviewed this survey and

the planned analyses, declaring them exempt due to the de-identification of individual data.

Dependent Variable: Enough doctors?

This study focuses on responses to one item on the questionnaire: "How much do you agree with the statement: I feel that there are enough doctors in my community?" Similarly worded items have been used in national polls and surveys concerning access to health care.[37, 38] Response options were "strongly agree", "agree," "neither agree nor disagree," "disagree," and "strongly disagree."

Independent Variables: Demographic, County, and Attitudinal Characteristics

Demographic characteristics of the respondents included in our study were age, gender, race, Hispanic ethnicity, educational attainment, income, self-reported health status, and presence of children under 18 living in household. (Figure 2 and Table 2) We also collected data on respondents' health insurance, number of visits to a physician in the past year, and travel time to their usual source of care. Prior studies have found many of these variables to be related to perceptions about physician supply.[32, 33]

Analyses were performed at the county level because the survey data were collected and coded for counties, and 'physician shortage area' designation is often calculated at the county level.

County characteristics included in this analysis were whether the county was adjacent to a metropolitan area, percentage of county population that is of a racial or ethnic minority, and percentage of population living below the federal poverty level. Physician (MD and DO) location data were taken from the Area Resource File (ARF), a national health services information system containing information on more than 6,000 variables at the county level (Quality Resource Systems, Inc. 2000-2005 under contract to the National Center for Health Workforce Analysis, Bureau of Health Profession within the Health Resources and Services Administration).[39] We used the ARF total number of clinically active physicians who were not federally employed (derived from the American Medical Association Masterfile for the year 2000 and the American Osteopathic Association 2001) and appended U.S. Census 2000 population information about our study counties to calculate physician-to-population ratios in each county.[7, 9, 40, 41] Ratio values were divided into five categories (1 to $\geq$4,000, 1 to 3,999-3,000, 1 to 2,999-2,000, 1 to 1,999-1,000, and 1 to $\leq$999), a practically interpretable scale for use in rural physician workforce planning. Because the physician population of interest was non-Federal and non-military, respondents receiving care in the Veteran's Administration hospital

system were dropped from our analysis (n= 69). The final population analyzed included 4,810 adults.

Six questions addressing perceptions about and experiences with health care were whether the respondent: 1) considered cost of care a problem, 2) perceived getting an appointment within one or two days to be difficult, 3) was satisfied with health care received in the past year, and 4) perceived that their doctors had the ability to help them. Early in data analyses the fifth and sixth question addressing perception of medical were noted to be so highly correlated that they appeared to be measuring the same thing, so the decision was made to analyze them as one perception (average of the two Likert scales). These two questions have been used together previously to assess an individual's readiness to see a physician.[34] The two questions were, "How strongly do you agree with the statement: 'If a person waits long enough, they can get over almost any illness without medical care.'?" and "How strongly do you agree with the statement: 'A person should use doctors only as a last resort.'?" All perception and experience item data were dichotomized from Likert scales.

Analysis

Demographic data from survey respondents compared to 2000 U.S. Census data in the SRAP counties indicated lower response rates for males, adults under age 39, African Americans, and those with household

incomes below $15,000. Analyses were weighted for these variables and county sampling probabilities using Stata software (Intercooled Version 8.0, Stata Corporation, College Station, Texas).[42, 43]

Race initially included all choices given to respondents: Native American, Asian, Pacific Islander, Black, White, Unknown, and Refused. There was also an ethnicity question asking the subject to self-identify as Hispanic, or nonhispanic. These categories were collapsed for final analyses into White nonhispanic, Black nonhispanic, and Other based on our sample distribution. Likewise, educational attainment, income, self-reported health status all had 5 or more response options in the original survey and were collapsed into a smaller number of categories or dichotomized when possible in order to simplify analysis and prepare variables for more easily interpretable use in a multivariate logistic regression model.

Responses to the primary question about the perception of adequate number of doctors in the community were dichotomized into "agree" or "disagree," with the small proportion (5.2%) of respondents in the neutral category grouped with those who "agree." The decision to do this was made only after the analyses were repeated three ways: first with the neutral category excluded from analyses, next with the neutral group included within the "disagree" group and last with the neutral group included within the "agree" group. There was no difference in the main outcomes in any of these approaches, so the choice was made to include

the neutral group within the "agree" group to comply with convention in the field.

These responses were then correlated with the actual physician-to-population ratio in the respondent's county, individual respondents' characteristics, county characteristics, and individuals' perceptions of and experiences with medical care, using chi-squared analyses for bivariate comparisons.

Using Stata software's "survey logistic regression" command, which automatically adjusts analyses for the weighting variables and accounts for the county sampling design mentioned earlier, we ran a logistic regression model to simultaneously adjust for all independent variables. The level $p < 0.05$ was considered statistically significant. We were interested in the relative contribution the physician-to-population ratio made to the variance of the full model, as compared with other groups of variables, so we ran four partial models (isolating physician-to-population ratio, individual characteristics, county characteristics, and perceptions of and experiences with health care) to compare how much their partial pseudo r^2 contributed to the full model's pseudo r^2.

Based on previous studies' findings that predisposing perceptions of and demographic characteristics could contribute as much to access as physician-to-population ratio, the intent was to examine this sample for evidence of a similar pattern. The Primary Investigator of the original dataset advised the inclusion of county characteristics in the analyses to

look for effects that might be based on local demographic differences. After examining the results of standard multivariate logistic regression model with all of the selected variables, partial logistic regression models were run to see how much variance could be explained by each group of characteristics by itself: Individual demographic characteristics, County characteristics, and predisposing perceptions of and experiences with medical care. After reviewing literature concerning the influence of primary care physicians on health outcomes,[27, 44] it was decided to do a post-hoc analysis of the question, comparing perception of physician supply to actual primary care physician (PCP) supply, specialist supply, and total patient care physician supply.

RESULTS

Descriptive Statistics

Most subjects were between 30 and 64 years old (average age 47.1) with more women (57.1%) than men in the weighted sample. The majority of subjects were White, about one-third Black and 2.8% other races. Most (75.0%) felt they were in good or excellent health and about half (46.6%) of the sample reported household incomes of less than $25,000 per year. Over half (57.8%) of the households surveyed had children under 18. About a quarter (25.7%) of the sample had no insurance, while 20.3% had Medicare, 6.5% had Medicaid, and 47.6% had private insurance. About half of the respondents had 2 or fewer

visits to a physician over the past year, and the majority (81.9%) lived within 30 minutes of their usual place of care (Table 1).

Responses to the primary question, "How much do you agree with the statement 'I feel there are enough doctors in my community?" were evenly divided with about half answering "strongly disagree" or "somewhat disagree" (45.7%), and about half "strongly agree" or "somewhat agree" (48.2%). The 5.1% of respondents who answered "neither" were grouped with "agree" for analyses (Figure 1).

Bivariate results

Almost half (49.3%) of respondents living in a county clearly qualifying as a medically underserved area (1 physician to > 4,000 people) believed there were enough doctors in their area while an only modestly higher proportion (59.4%, p=.005) of respondents felt this way in areas with much higher physician-to-population ratios (1 physician to less than 1,000 people). (Figure 2)

Bivariate analysis revealed that those who were more likely to perceive an adequate local physician supply were male, older than 65, White, in good or excellent health, and traveled less than 30 minutes to care (Table 1). The perception of adequate physician supply was not related to educational level, income, having children in the household, insurance status or number of doctor visits in the past year. County-level characteristics significantly associated with believing there are enough

local physicians included a higher physician-to-population ratio, lower poverty rate, and a lower percentage of racial and ethnic minorities.

All of the questions about perceptions of and experiences with medical care were significantly related to the belief that there were enough physicians in the community. Respondents were more likely to feel there were enough doctors in their community if they reported that the cost of care was not a problem (58.1% vs. 42.4% of those who reported that cost of their care was a problem, $p < .0001$). Subjects who reported that it was easy to get an appointment were also more likely to feel there were enough doctors in their community versus those who reported that this was difficult (55.8% vs. 44.6%, $p = .0007$). Those who expressed satisfaction with their health care and confidence in their doctor were also more likely to believe that there were enough local physicians than those who did not (55.7 vs. 36.3%, $p < .0001$ and 57.2% vs. 43.6%, $p < .0001$). Further, people who believed seeing a doctor should be one's last resort were more likely to feel there were enough doctors than those who felt that one should see a physician early with problems (68.0% vs. 51.1%, $p < .0001$).

Multivariable results

The full logistic regression model adjusting for all of our independent variables showed the same individual characteristics had a significant positive relationship with perceptions of an adequate local

physician supply as the bivariate chi^2 models (male, older than 65, White, in good or excellent health, and traveled less than 30 minutes to care). The only county characteristic that had a significant association when adjusting for all variables was the physician-to-population ratio. All of the perceptions of and experiences with health care variables except for the "getting an appointment is/is not a problem" variable were significantly associated with perception of physician supply, with those who believed that "illnesses resolve with time and seeing a physician should be the last resort" being much more likely (OR 2.0, p <.001) to feel there were enough physicians.

In an attempt to isolate the relative importance of individual demographic characteristics, county characteristics, and perceptions of and experiences with health care, each of these groups of characteristics was tested in a model alone, without adjusting for the other two groups of characteristics. To assess the stability of the model and the relationships between the dependent and independent variables, we also analyzed this data with a more traditional backward elimination logistic regression. The outcomes of those models were the same.

The partial pseudo r^2 analyses allows a ranking of the groups of variables in our model according to their contribution to the variance in whether people felt there were enough doctors in their community. The groups of variables who contributed most to people's perceptions of whether there were enough doctors in their community were, in order: 1.)

Perceptions and experiences with health care, 2.) Individual characteristics, 3.) county physician-to-population ratio, and 4.) other county characteristics. The overall pseudo r2 of the full model was .058.

Post-hoc analysis

In a bivariate comparison looking at the percentage of people who felt there were not enough physicians in their area against the ratio of PCPs, specialists, and all physicians to the county population the relationship was not tightly associated with the ratio of primary care physicians: population. In other words, as the supply of primary care physicians went up, the number of people who felt there were not enough physicians went down (Figure 5). This relationship was not clear or consistent for specialists. However, none of these relationships were statistically significant and the numbers of specialists in the areas we studied was quite small, so these analyses will not be included in the paper we submit for publication.

DISCUSSION

People's perception that there are or are not enough doctors in their community is associated with the actual number of physicians per capita in the respondent's county, but is more strongly associated with their perceptions of and experiences with medical care. Significant associations with perception of adequate physician supply included age,

race, gender, travel time to care, and whether respondents felt they could afford care. We also found that people who perceived a lack of local physicians were more likely to be dissatisfied with and less confident in the care they had received in the past year.

Limitations

When asked whether there were enough doctors in their community, it is likely that for many the term "community" evoked geographic or social demarcations other than county, which is the geographic unit for which we had "community" in our analyses. This sample consisted of rural Southern counties selected in part due to problems with health care access. Therefore our results may not generalize to more urban areas or areas with better access to health care.

Our telephone survey used landline telephone numbers only, thereby excluding household without a phone or with only a cellular phone from participation. It is not yet known how or whether the prevalence of cell phone use may bias data in phone surveys, especially in a rural Southeastern population.

The selected ordinal categories of physician-to population ratio (1 physician to >3,999 population being the lowest and 1 physician to <1,000 population being the highest) may not have included categories with a high enough concentration of physicians to make an appreciable difference in people's perception of local physicians. Perhaps if people

who lived in areas with 1 physician for every 250 or 500 people were surveyed we would have found a closer association between perception of physician supply and actual physician supply. However, due to the nature of the original sample, few people were surveyed who lived in areas with a high physician-to-population ratio. There may be a threshold effect for physician-to-population ratio above which people's perceptions more closely reflect actual physician-to-population ratio and perhaps we did not have the proper population or region in which to detect this.

In the results section, while the partial models and r^2 analyses show that more of the variance was explained by 'perception of and experience with medical care' characteristics than any other group of variables, we also see that all of the variables in the model taken together only explain .058 of the total variance between groups who felt there were enough physicians compared to those who did not. While all variables hypothesized to have any relationship to people's perceptions about adequacy of physician supply were included in the full model, there may be variables that we did not include that contribute to this variance, or the association may be in large part random.

Strengths and Implications

Our finding that travel time to care was significantly associated with feeling there are not enough physicians in one's area supports Jacoby's assertion that higher county physician-to-population ratios

alone do not necessarily imply greater speed of access, while the geographic distribution of physicians (among other factors) in rural areas does play a role in access to care.[9] In order to expedite access, the physician's office must be convenient and potential patients must have transportation to the office. The frustration that may ensue from the perception that there are not enough local doctors or that getting to a local physician is difficult may contribute to dysfunctional care seeking behavior such as postponing care or increasing the use of the emergency room.

Neither the needs-based model nor the demand-based model of workforce planning takes into account the complex interplay of needs, wants, and perceptions as they relate to the adequacy of the physician workforce. Needs-based proponents would say that we have evidence-based recommendations about the minimal amount of medical care needed for preventive health and should train enough doctors to assure this care. Demand-based proponents would argue that as people use more care, we should attempt to provide more doctors. However, it may be the case that the "problem of not having enough physicians" would be best solved by correcting financial barriers to care, helping people get to outpatient visits, and educating the general public about appropriate utilization of medical care rather than producing or recruiting more physicians.

A central goal in physician workforce planning is to improve access to physician as a means of facilitating appropriate use of health care. If people do not feel they have "enough" local physicians, we need to understand precisely what factors are influencing this sense of inadequacy before we strive to fix it. As Andersen and Aguire pointed out almost 25 years ago, financing programs to help people pay for their care may do as much to improve people's satisfaction with access to care as increasing the physician-to-population ratio. Developing programs to address cost of care, distance or transportation to care, and people's confidence in and satisfaction with medical care may improve perception of access with minimal increases in the physician workforce.

People's perceptions are important in their own right, as they are associated with behavior and with satisfaction, which is now considered by most to stand alone as a health care outcome.[45-47] The "consumer viewpoint" when it comes to medical manpower has largely been ignored since the late 70's / early 80's, when there was a call for more research in this area.[30] This study addresses the question in a unique way in an underserved population.

Outcomes in access to care models (Figure 1) may become more difficult to define if we acknowledge the loop: perception of care affects care-seeking and experience with care affects perception of care (Figure 2). However, the recognition of this circularity may lead future researchers to more closely examine their "satisfaction with care" variable as an outcome. Our study suggests

that satisfaction with care is highly associated with many other satisfaction variables…which may all have their root in pre-existing attitudes.

Though the available dataset did not have adequate numbers of specialists and primary care physicians to detect it, analyses indicated that there may be a closer association between people's perception of physician supply and primary care physician-to-population ratios than total patient care physician-to-population ratio. If people's perception of physician supply is better with higher numbers of primary care physicians and is not related to numbers of specialists this might indicate a need to maintain or increase Title VII funding to train more primary care physicians.

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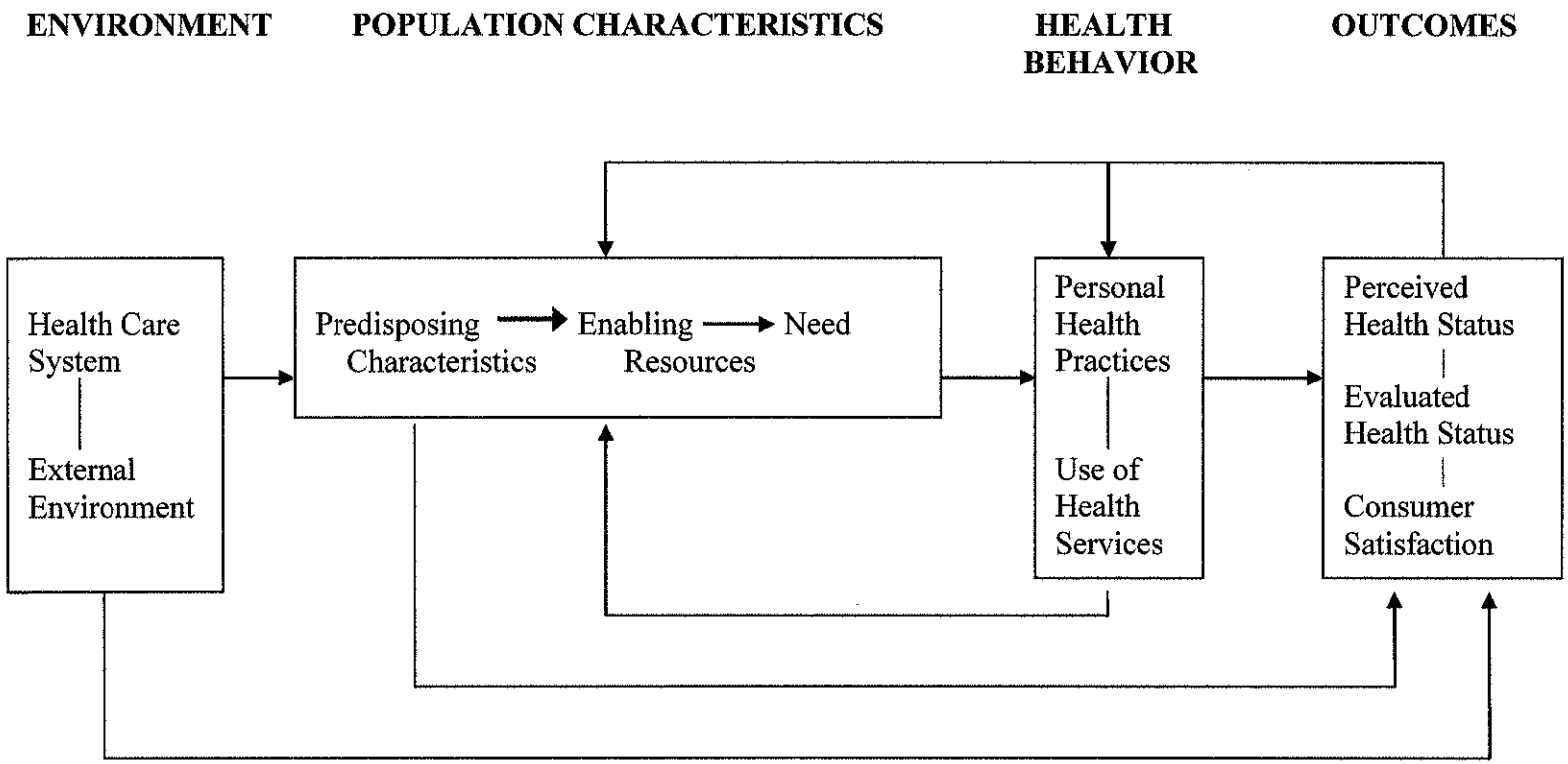
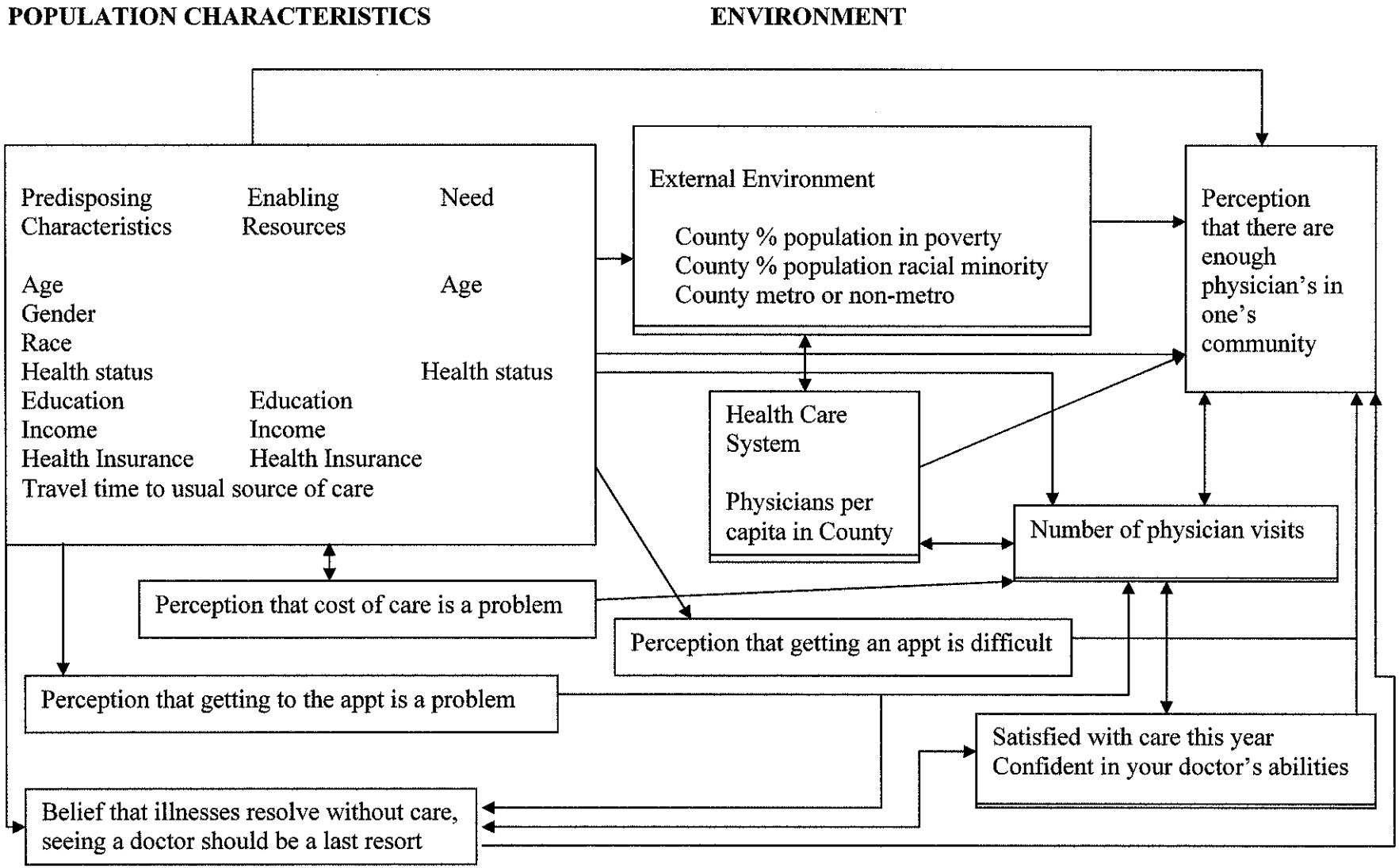
Figure 1: Andersen's Emerging Model of the Behavioral Model of Access to Health Care (1995)[1]



Journal of Health and Social Behavior 1995, Vol 36 (March): 1-10.

Figure 2: Proposed (Modified from Andersen) Model of Access



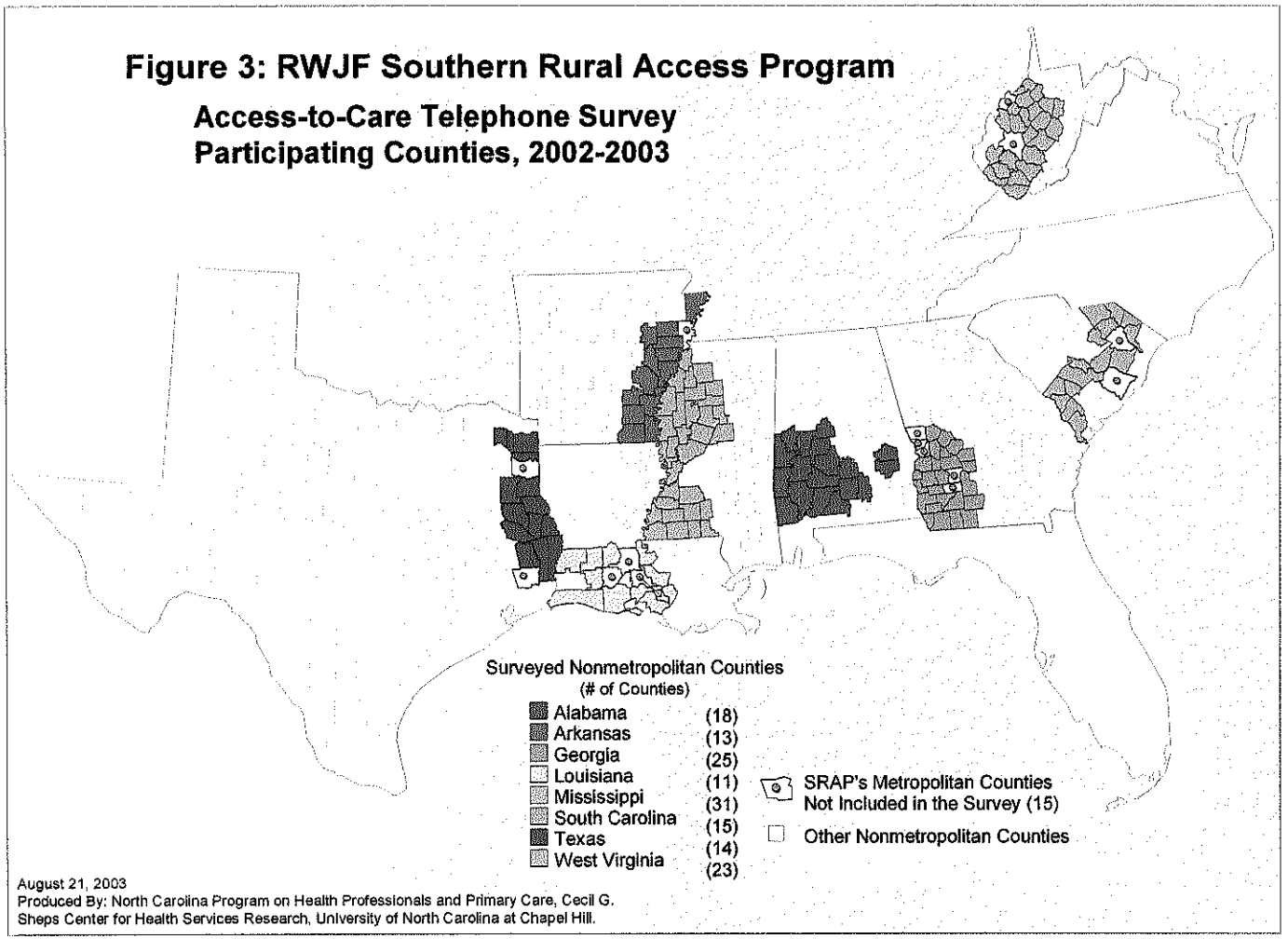


Figure 3: RWJF Southern Rural Access Program
Access-to-Care Telephone Survey
Participating Counties, 2002-2003
Surveyed Nonmetropolitan Counties
(# of Counties)
Alabama (18)
Arkansas (13)
Georgia (25)
Louisiana (11)
Mississippi (31)
South Carolina (15)
Texas (14)
West Virginia (23)
SRAP's Metropolitan Counties Not Included in the Survey (15)
Other Nonmetropolitan Counties
August 21, 2003
Produced By: North Carolina Program on Health Professionals and Primary Care, Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

Figure 4: Percentage who Agree "There are enough doctors in my community." Compared to their County Physician-to-Population Ratio (p=.005)

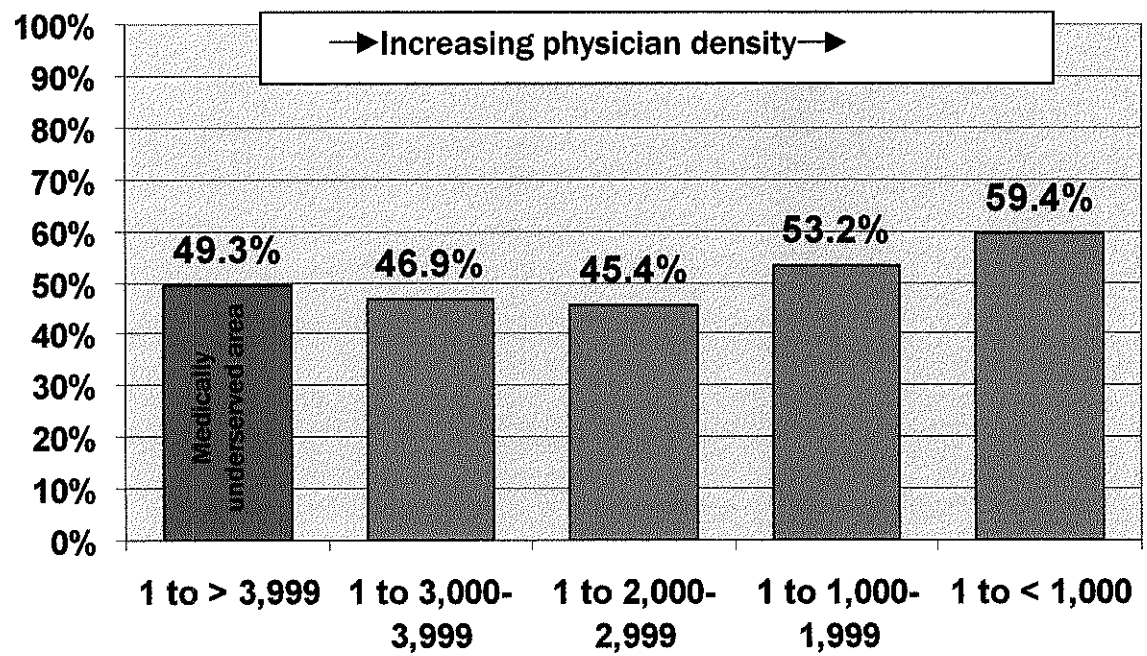


Table 1. Summary Univariate Statistics (n=weighted counts), and Bivariate Analysis--Percent in each group who agreed "I feel there are enough doctors in my community."

Individual Characteristics	n (%) Univariate data Describing sample	Percent who agree that "There are enough doctors" in each group	*p* -value for chi ^{2} test
Age (n=4711)			
18-30 years	952 (20.3%)	51.1%	.0003
31-50 years	1870 (39.7%)	53.4%	
50-64 years	1012 (21.5%)	51.7%	
65 years and older	877 (18.6%)	62.6%	
Gender (n=4711)			
Women	2641 (56.1%)	51.7%	.003
Men	2070 (43.9%)	57.4%	
Race (n=4632)			
White, nonhispanic	2935 (63.3%)	58.0%	<.0001
Black, nonhispanic	1570 (33.9%)	47.1%	
Other	127 (2.8%)	51.1%	
Education (highest attained) (n=4691)			
Less than HS graduation	916 (19.5%)	56.5%	.290
HS grad/GED/tech school	2821 (60.1%)	54.1%	
College graduate	954 (20.3%)	52.2%	
Annual household income (n=4688)			
$\leq$ $14,999	1380 (29.3%)	54.3%	.136
$15,000 – 24,999	806 (17.1%)	49.9%	
$25,000—49,999	1396 (29.6%)	56.2%	
$\geq$ $50,000	1129 (24.0%)	54.7%	
Self-Reported Health Status (n=4688)			
Good or excellent health	3516 (75.0%)	55.6%	.006
Fair or poor health	1172 (25.0%)	49.6%	
Has children under 18 years old (n=4695)			
Yes	2713 (42.2%)	52.0%	.068
No	1982 (57.8%)	55.8%	
Health insurance Status (n=4711)			
No insurance	1210 (25.7%)	53.2%	.770
Medicaid	306 (6.5%)	54.7%	
Medicare	955 (20.2%)	56.4%	
Private insurance	2241 (47.6%)	53.8%	
Number of physician visits in past year (n=4523)			
0-2 visits	2258 (49.9%)	56.0%	.109
3 or more visits	2265 (50.1%)	52.6%	

Typical travel time to care (n=4659)			
30 minutes or less	3817 (81.9%)	43.9%	<.0001
Greater than 30 minutes	842 (18.1%)	44.7%	
County Characteristics	n (%) Univariate data Describing sample	Percent who agree that "There are enough doctors" in each group	*p* -value for chi ^{2} test
Number of active MDs in county (n=4697)			
1 MD per more than 4,000 people	166 (3.5%)	49.3%	.006
1 MD per 3,000-3,999 people	267 (5.7%)	53.1%	
1MD per 2,000-2,999 people	453 (9.6%)	45.4%	
1 MD per 1,000-1,999 people	2075 (44.2%)	53.2%	
1 MD per less than 1,000 people	1736 (37.0%)	59.4%	
Percent poverty in county (n=4711)			
0-20%	2059 (43.7%)	58.4%	.012
20-36%	2653 (56.3%)	50.9%	
Percent racial minorities in county (n=4711)			
< 50%	3164 (67.2%)	56.5%	.021
≥ 50%	1547 (32.8%)	49.4%	
Adjacent to Metropolitan Area (n=4711)			
Yes	3077 (65.3%)	54.2%	.234
No	1634 (34.7%)	51.4%	
Health care attitudes and experiences	n (%) Univariate data Describing sample	Percent who agree that "There are enough doctors" in each group	*p* -value for chi ^{2} test
How much of a problem is cost of care? (n=4656)			
Not a problem/minor problem	3490 (75.0%)	58.1%	<.0001
Somewhat a problem/great problem	1166 (25.0%)	42.4%	
How difficult is it to get an appointment? (n=4530)			
Very easy/easy	3932 (86.8%)	55.8%	0.0007
Somewhat difficult/Very difficult	598 (13.2%)	44.6%	
Believes most illnesses resolve without medical care, doctors should be used only as last resort. (n=4685)			
Disagree	3834 (18.2%)	51.1%	<.0001
Agree (Doctors are last resort)	851 (81.8%)	68.0%	
Satisfied with your care this year? (n=4660)			
Very/Mostly	4304 (92.3%)	55.7%	<.0001
Somewhat/Not at all	356 (7.7%)	36.3%	
Confident in your doctor's abilities? (n=4664)			
Very/Mostly confident	3706 (79.5%)	57.2%	<.0001
Somewhat/Not at all confident	958 (20.5%)	43.6%	

Table 2. Factors associated with feeling that there are enough physicians in one's community.

	Full Model (n=4,461) Odds Ratio	*p*	Partial Pseudo R^2 for each designated group of variables	Pseudo R^2 statistic for Full Model (all listed characteristics)
MDs per 1,000 population	**1.18**	**.002**	.005	
Individual Characteristics				
Age over 65	**1.37**	**.006**		
Male	**1.26**	**.011**		
White	**1.37**	**.001**		
Education less than high school diploma	0.98	.857		
Annual household $25,000 or more	0.97	.762	.016	
Good or excellent health	**1.21**	**.048**		
No children <18 yrs old living in the household	0.99	.922		
No health insurance	1.20	.090		
Less than 3 physician visits last year	1.02	.843		
Travel time to usual source of care <30minutes	**1.52**	**<.001**		.058
County Characteristics (other than MD: population)				
Proportion of households in poverty <20%	1.18	.211		
Minority population proportion <50%	1.01	.948	.009	
County adjacent to a metro area	1.14	.321		
Attitudes and experience with health care				
Cost of care is not a problem for respondent	1.45	<.001		
Getting an appointment is not a problem for respondent	**1.13**	**.397**		
Respondent believes that illnesses resolve without care,			**.037**	
and that seeing a doctor should be a last resort.	**2.00**	**<.001**		
Satisfied with care received this year	**1.67**	**.023**		
Confident in their doctor's abilities	**1.39**	**.006**		

Results in "Full Model" column refer to survey logistic regression model containing all of the variables listed above. Model F statistic =12.04 (df= 19, 127), model p <.0001. The partial pseudo-r2 statistics refer to variance explained by only the indicated variable/s, and the pseudo-r2 statistic for the full model in the leftmost column is the variance explained by all of the variables listed in the full model.

Figure 5: Percent who feel there are not enough doctors compared to actual concentration of doctors